

DCM31

1 or 2-leaf gate control for 24V_{DC} drive units each 11A



Installation & operating instructions for electricians & (electrically) skilled persons

Please keep these instructions in a safe place to ensure they are available should you have any questions at a later date.

Not intended for issuing to end customers (users)!

- An instruction manual / instruction for use must be prepared for the user for "their application".
- A handover declaration and/or acceptance inspection certificate must be prepared.
- Any possible hazards must be pointed out to the user.
- Operation and servicing/maintenance of the unit must be explained.

Important! Please read these instructions before putting into service!

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1) Intended Purpose

This motor control unit is intended for the following 24V/DC drive units:

- On one or two-leaf garage or courtyard gate systems (e.g. hinged, sliding, tilting and up-and-over gates)
- In industrial, residential, business and commercial areas and in small businesses
- According to the stipulations in these instructions.

These **instructions** are intended for the fitter of the control unit and the processing industry, however not for issue to the owner/operator of the gate system. The end product manufacturer is responsible for preparing suitable instructions for the complete gate system.

a) Requirements

The motor control unit is not operational until it is installed in the ready for use gate system.

This requires external components such as e.g. ...

- command input devices,
- signalling devices,
- sensors and
- the drive unit,

but which are not supplied with this motor control unit.

This control unit is therefore a "non ready for use component" from a legal point of view. It therefore does not fall within the scope of various EC Directives until it is integrated in the end product (gate system).

b) Legal requirements

The end product manufacturer is thus responsible for compliance and declaration of CE conformity. The control unit complies with the requirements in

- **DIN EN 60204**. This makes it easier for you to carry out the conformity assessment according to the Machinery Directive.
- **DIN EN 50081 T1/2** and **EN 55011** and **EN 55014**. This makes it easier for you to carry out the conformity assessment according to the EMC Directive.
- **VDE 0700 Part 95** (Draft 02/98; IEC 60335-2-95) and **EN 12445** and **EN 12453** concerning requirements for motor control units for "power-driven doors and gates" (formerly ZH 1/494).
- **DIN EN 60335-1**. This makes it easier for you to prepare the declaration of conformity according to the so-called "Low Voltage Directive".
- **EN 61 508, SIL2, Functional Safety**.

c) Technical qualification requirements

These instructions require technical knowledge, which corresponds to completed vocational training in at least one of the following job profiles:

- Electrical fitter,
- Electrical installation fitter,
- Electrical machine fitter,
- Electro-mechanic,
- Industrial electronics technician ...

or knowledge as an (electrically) **skilled person** according to the German accident prevention regulation **BGV A2** (VBG 4).

The product is supplied as a component in "**especially EMC-expert firms**" in accordance with EMC law.

d) Important safety instructions

- Reliable operation is only possible if the unit is carefully installed according to these instructions. We do not provide any guarantee or accept liability for any damage caused by failure to comply with these instructions.
- During the learning runs / putting into service of 2-leaf gate systems with closing edge, check setting of the correct door closing delay of the motors and if necessary correct, so that the closing edge does not travel at a flat horizontal angle to the other leaf, which could cause damage to the gate system and to risks for objects and people!
- After installation, the customer or fitter of the gate drive unit must check for compliance of the maximum closing forces according to the standards **EN 12445** (Safety in use of power operated doors, test methods) and **EN 12453** (Safety in use of power operated doors, requirements) or the applicable standards and regulations at the respective installation location!
- The safety equipment requirements e.g. depend on whether the gate is used in a private or commercial area, whether it is in a public street or the controls are generally accessible
- Information is available from electric power suppliers, VDE and the employers' professional insurance association.
- ESD-compatible earthing must be ensured for all work on the control unit. Otherwise there is a risk of damage or even destruction of the control unit.

2) Installation

This requires 4 screws with a shank diameter of 4mm.

a) **Suitable installation site**

The motor control unit is supplied as a module in a simple plastic housing. You should therefore choose an installation site with the following conditions:

- The **ambient temperature** may not be lower than -20°C and not higher than +50°C.
- The **air humidity** must lie within 30...90% RH.
- **Electromagnetic fields** at the installation site must be reliably shielded.
- Preferably protected against direct sunlight and driving rain

b) **Installation**

The internal temperature rating is designed for vertical installation.

[X1], [X5] show the installation, whereby the cables must be brought out at the bottom and sealed with the enclosed threaded joints to prevent penetrating moisture.

When choosing the type of fixing, you must take into account the weight of the control unit (see technical specifications).

Properly fit the control unit housing in the suitable installation site.

3) Brief Explanation of Terms Used

You will come across the following terms in these instructions, not in everyday use:

Release / release time

In various safety functions you can choose how the gate is to behave in a given situation. In the event of “release” the gate only moves for the set release time in “opposite direction”, in order to release the obstruction.

Active leaf

In 2-leaf gate systems, one leaf can be chosen as the “active leaf”. This can then be opened separately (e.g. as a doorway for people).

OSE

Self-monitoring Optical Safety Equipment as photoelectric barrier or as contact strip.

Panic function

In the panic function an open/close command during a gate travel always results in the stopping of the gate travel. The gate only starts to move in the required direction if actuated again.

Reversing

If various safety functions you can choose how the gate is to behave in a given situation. In “reversing” the gate moves in the opposite direction to the end position.

Smooth travel-out

The motor output / motor speed can be reduced over the last part of the travel path so that the gate does not hit the end stop at full speed.

Electricity stop

The control unit monitors the motor current for obstacle detection. You can choose how the control unit reacts if the set value is exceeded.

Partial opening

The gate can be specifically moved to a previously selected position between the limit switches (e.g. to allow people through).

a) Abbreviations used in the instructions

[Bl.1]	= 15 pin slot for the radio module
[Bl.2]	= 2x10 pin slot for 1 or 4 channel radio receiver
[J1]	= Jumper for safety equipment (SE)
[Kl.1]..[Kl.33]	= Reference to terminals
M1, M2	= Motor 1 or Motor 2
[M.A0]..[M.A9]	
[M.b0]..[M.b9]	
[M.C0]..[M.C9]	
[M.d0]..[M.d9]	= Menu items A0 to d9
[Ta.+]	= “+” pushbutton in the control panel under the 7 segment display
[Ta.-]	= “-” pushbutton in the control panel under the 7 segment display
[Ta.F]	= “Radio” pushbutton in the control panel under the 7 segment display
[Ta.M]	= “Menu” pushbutton in the control panel under the 7 segment display
[X1]..[X10]	= Reference to figure in the separate graphic overview
{F0}..{F9}	= Radio module function, shown in the display
{Er.00}..{Er.29}	= Error/fault message, shown in the display

4) Connections

a) Terminals

[X2], [X6]

Only work on the controls after it has been disconnected from the power supply and has been ESD-compatibly earthed!

- 230 volt mains voltage can be applied to [KI.1]..[KI.4] and [KI.30], [KI.31]. Potentially fatal danger!
- Never connect mains voltage to [KI.5].. [KI.29].
- Failure to comply causes immediate destruction of the controls and the guarantee expires!
- Signal and motor cables (e.g. pulse, open, stop, close...) must not exceed a length of max 30 m! This does not apply to the mains supply cable.

[KI.1]+[KI.2] mains voltage 230V / AC

Terminal 1 = N conductor

Terminal 2 = L conductor

- Comply with the local safety regulations and applicable VDE regulations.
- We recommend installation of a motor protecting switch in the mains supply cable.

[KI.3]+[KI.4] light / warning light 230 V / AC output, max. 500W

Terminal 3 = N conductor

Terminal 4 = L conductor (L= connected)

- The light/warning light function is set via [M.b2].
- The switched status is displayed by the yellow "Light" LED [X7].

[KI.5]+[KI.6] Motor M1, 24V / DC output

Terminal 5 = "-" for opening

Terminal 6 = "+" for opening

- Motor 1 is the main motor and is also used as the active leaf motor.
- If the control unit is run with one motor only [M.C1], this must be connected to M1.
- In 2 motor mode, for opening motor 1 starts at the same time or before motor 2 [M.C3] and for closing motor 1 starts at the same time or after motor 2 [M.C2].
- After the control unit has been installed and the first pulse command is given, the direction of travel must be "OPEN".
- If the drive unit, despite bar running upwards in the 7 segment display, starts up in the "CLOSE" direction the connection wires [KI.5]+[KI.6] must be switched over.
- The control unit learns the maximum motor current for each direction of travel.
- Motor adjustments are made in [M.A1]..[M.A8].

[KI.7]+[KI.8] Motor M2, 24V / DC output

Terminal 7 = "-" for opening

Terminal 8 = "+" for opening

- After the control unit has been installed and the first pulse command is given the direction of travel must be "OPEN".
- If the control unit is operated with one motor only [M.C1], it must be connected to M1.
- In 2 motor mode motor 2 starts in opening at the same time or after motor 1 [M.C3] and in closing motor 2 closes at the same time or before motor 2 [M.C2].

- If the drive unit, despite the bar moving upwards in the 7 segment display, start up in the "CLOSE" direction, the connection wires [KI.7]+[KI.8] must be switched over.
- The control unit learns the maximum motor current for each direction of travel.
- Motor adjustments are made in [M.A2]..[M.b0].

[KI.9]+[KI.10] output 12 V DC / stable

Terminal 9 = 12 V/DC stable, max. 40 mA

Terminal 10 = 0 V/earth

- e.g. for OSE connection

[KI.10]+[KI.11] output 24 V / DC unstable

Terminal 11 = 24 V/DC unstable, max. 200 mA

Terminal 10 = 0 V/earth

- e.g. for connecting the supply voltage for a photoelectric barrier

[KI.12]+[KI.13] relay output (floating)

- For connecting electric lock or other options, max. 24 Volt, 4 ampere.
- The function is set via [M.C4].
- The switched status is displayed via the yellow "OUT" LED [X7].

[KI.14]+[KI.15] emergency stop

- Controls with floating contact can be connected to the emergency stop input.
- The behaviour of the control unit following an emergency stop is set via [M.b8].
- The contact must be closed in the idle condition (break contact).
- Several controls can be connected in series.
- An unused emergency stop input must be jumpered!
- The switched status of the emergency stop input is displayed by the red LED behind the [KI.14]+[KI.15].
- The emergency stop input directly switches off the motor relay for safety reasons and therefore is still active even if the electronics fail!
- In the event of an emergency stop command the motor stops immediately.
- If the emergency stop command while the motor is running, with the next pulse command the gate travels in the "opposite direction" (away from the danger spot).
- If an emergency stop command is given while the gate is at a standstill, the gate generally travels in the OPEN direction when the next pulse command is given.

[KI.16]+[KI.17]+[KI.18] limit switch M1

Terminal 16 + 17 = limit switch M1 OPEN

Terminal 18 + 17 = limit switch M1 CLOSE

[KI.19]+[KI.20]+[KI.21] limit switch M2

Terminal 19 + 20 = limit switch M2 OPEN

Terminal 21 + 20 = limit switch M2 CLOSE

- Controls with floating contact (break contact) can be connected at the limit switch inputs.
- The contact must be closed in the idle condition (opened in the end position).
- The switched status is displayed via the LEDs behind the terminals. (LEDs lit in end position, i.e. if limit switch pressed/opened)
- If [M.C6] = 00 or = 02, the limit switch inputs function and the LEDs are always off.
- Alternatively, drive units with integrated limit switches can be used [M.C6], which interrupt the motor current in the relevant direction. The control unit then interprets

this as an external limit switch. The limit switch behind the terminals is not displayed.

[KI.22]+[KI.23] photoelectric barrier (LS)

Terminal 22 = LS signal input

Terminal 23 = connected earth

- A photoelectric barrier or an electrical safety contact strip with a floating break-contact element can be connected.
- The function of the input is determined via [M.b4].
- If the input is not used, it must be jumpered with a wire jumper (delivered condition).
- The switched status is displayed by the yellow LED behind [KI.22]+[KI.23].
- During the control unit self-test, the LED briefly flashes.
- The input has a safety function and is monitored by self-tests of the electronics.
- The "close after leaving the photoelectric barrier" function [M.b5] can be triggered via the photoelectric barrier input.

[KI.23]+[KI.24] safety input (SE) for closing edge safety device 8K2 or OSE

Terminal 23 = connected earth

Terminal 24 = SE signal input

- Optional use of a 8K2 safety strip or OSE is possible as a closing edge safety device.
- The type of strip connected and function of the input are set via [M.b6].
- OSE connection: KI.9=+12V, KI.10=earth, KI.24=signal
- The switched status is displayed via the yellow LED behind [KI.24].
- If the SE input is not used, the [J1] must be connected to NC [X4] (8k2-resistor is switched on internally) and [M.B6] set to 8k2 (10) or the SE input deactivated [M.B6] = 00.
- If a closing edge safety device is connected, [J1] must be connected to SE [X4].
- This input has a safety function and is monitored by self-tests of the electronics.

[KI.25]+[KI.26] input A (pulse / open)

- Input for pushbutton, key-operated switch, external radio, etc.
- The controls must have a floating contact, which is open in the idle condition (make contact).
- Several pushbuttons, etc. can be connected in parallel.
- The input is connected internally parallel to the slot of the radio receiver ([BI.2] channel 1).
- The switched status is displayed by the green LED behind [KI.25]+[KI.26].
- The function of the input is set via [M.b9].
- Simultaneous actuation of input A and input B has an emergency stop function.

[KI.26]+[KI.27] input B (partial opening/ active leaf / close)

- Input for pushbuttons, key-operated switch, external radio, etc.
- The controls must have a floating contact, which is open in the idle condition (make contact).
- Several pushbuttons, etc. can be connected in parallel.
- The input is connected internally parallel to the slot of the radio receiver ([BI.2] channel 2).
- The switched status is displayed via the green LED behind [KI.26]+[KI.27].
- The function of the input is set via [M.b9].

- Simultaneous actuation of input A and input B has an emergency stop function.

[KI.28]+[KI.29] antenna

- An antenna litz wire must be connected to [KI.29] and must be stretched parallel to the main reception direction along its whole length.
- The antenna litz wire can be fed out through the small hole next to the self-sealing plugs.
- The largest range is achieved by laying the cable at a large distance from the metal parts (concrete ceilings, cables, ...).
- If a rod antenna is used, the shielding of the coax cable is connected to the adjacent earth terminal [KI.28].

[KI.30]+[KI.31] transformer connection (primary 230V/AC)

[KI.32]+[KI.33] transformer connection (secondary 24V/AC)

- An external power transformer (usually installed in the factory) must be connected to [KI.30] and [KI.31] (primary) and [KI.32] and [KI.33] (secondary).
- For safety and EMC reasons, a short-circuit proof toroidal transformer to EN60742 (VDE0551) must be used.

b) Radio

[X8], [X10]

- The control unit can be remotely controlled, either via the radio module (evaluation and storage of the radio code in the controller of the control unit) or via a radio receiver with integrated logic for evaluation and storage of the radio code. The radio receiver and radio module work independent of each other.

Radio module mode [BI.1]

- A suitable radio module must be plugged with correct orientation into the 15-pin socket connector [BI.1] [X9] [X8].
- Replace radio module: (frequency change): If noise exists in the frequency band used, the control unit can be converted to another frequency by replacing the radio modules.
- Procedure:
 - Switch off power supply!
 - Carefully pull the radio module out of the plug-in holder.
 - Plug-in the new radio module with the required frequency with the "correct orientation".
 - Switch supply voltage back on.
 - Delete radio (see p 20).
 - Teach new sender (see p 20).
 - The transmitters must have the same frequency as the new radio module!

Radio receiver [BI.2]

- A suitable radio receiver must be plugged in, with the correct orientation, in the 2x10-pin socket connector [BI.2] [X9] [X10].
- Channel 1 is internally connected parallel to input A.
- Channel 2 is internally connected parallel to input B.
- The function of channels 1 and 2 is set via [M.b9].
- Refer to the respective operating instructions for information on how to use the radio receiver.

5) Controls / Displays

[X7]

[Ta.+] +: value + / menu + / open function

[Ta.-] -: value - / menu - / close function

[Ta.F] **Radio:** key to teach / delete the radio in radio module mode

[Ta.M] **Menu:** menu selection/ display input status

a) LEDs next to the display

[X7]

Light (yellow)Light / warning light control display

radio (red) radio display for radio module mode (reception)

OUT (yellow)display output OUT [KI.12]+[KI.13]

b) LEDs behind terminals

[X6]

behind [KL.14]+[KI.15] red emergency stop input

behind [KL.16]+[KI.17] green limit switch M1 OPEN

behind [KL.17]+[KI.18] green limit switch M1 CLOSE

behind [KL.19]+[KI.20] green limit switch M2 OPEN

behind [KL.20]+[KI.21] green limit switch M2 CLOSE

behind [KL.22]+[KI.23] yellow photoelectric barrier (LS)

behind [KL.23]+[KI.24] yellow closing edge safety device (SE)

behind [KL.25]+[KI.26] green input A

behind [KL.26]+[KI.27] green input B

c) Jumper [J1]

[X4]

- If a closing edge safety device is connected to the SE input (8K2 or OSE), the jumper must be connected to SE.
- If no closing edge safety device is connected, the jumper must be connected to NC.

d) 2 x 7-Segment: Display menus and states

Gate status (horizontal bar)

[X7]

Segment	Segment status	Motor	Gate status
A	Lit	1	Standing in CLOSE end position
B	Lit	1	Standing between end positions
C	Lit	1	Standing in OPEN end position
D	Lit	2	Standing in CLOSE end position
E	Lit	2	Standing between end positions
F	Lit	2	Standing in OPEN end position
Left	Bars moving upwards	1	Opening
Left	Bars moving downwards	1	Closing
Left	Bar stopped + flashing	1	Last travel was ended with SE, LS or forced stopping (obstruction!)
Right	Bars moving upwards	2	Opening
Right	Bars moving downwards	2	Shutting
Right	Bar stopped + flashing	2	Last travel was ended with SE, LS or forced stopping (obstruction!)
Left point (0)	Lit	1 + 2	Automatic closing is active, keep open time running
Right points (0)	Flashing	1 + 2	Automatic closing is active, early warning running

Input status (vertical bar)

[X7]

Segment	Segment status	Input
1	lit	limit switch M1 OPEN actuated = open
2	lit	limit switch M1 CLOSE actuated = open
3	lit	input LS pressed = open
4	lit	input SE pressed = open or short-circuited
5	lit	input A actuated = closed
6	lit	input B actuated = closed
7	lit	limit switch M2 OPEN actuated = open
8	lit	limit switch M2 CLOSE actuated = open
9	lit	emergency stop actuated = open
0	lit	Automatic closing is active, keep open time running
0	flashing	Automatic closing is active, early warning running

Learning runs:

Brief display of the digits 1..4 = number of learning runs still to be performed separately for M1 (left display) and M2 (right display).

Radio:

- During teaching for radio module mode the display switches between gate status and {F0}..{F9} for the selected radio function. In addition, the "radio" LED next to the 7-segment display flashes.
- Deletion of all codes in radio module mode is indicated by rapid flashing of {FL} in the display and by rapid flashing of the "radio" LED.
- If a teaching radio is detected, the teaching function {F0}..{F9} is shown in the display and the "radio" LED is lit.

Error messages:

Display switches between "ER" (error) and error number.

Menu settings:

The menu item (A0...d9, prefixed letter) or the set menu value (00...99) is displayed.

e) Function of the keys

[X7]

"Menu" key [Ta.M]

[Ta.M] < 1sec actuated in function mode = switch the display between
gate status (horizontal bar)
and / input status (vertical bar).

"+" key [Ta.+]:

- in gate status mode and input status: opening or stop.
- in setting mode: see 6)a) Using menu function, p. 14

"-" key [Ta.-]:

- in gate status mode and input status: closing or stop
- in Adjustment mode: see 6)a) Using menu function, p 14

6) Putting into Service / Programming

a) Using menu function

The buttons [Ta.+], [Ta.-] and [Ta.M] next to the display [X7] can be used to set/change the individual functions of the control unit as follows:

- [Ta.M] > pressed for 1 sec = Switch between display
function (display: horizontal or vertical bar)
and setting (display: letters/digits).
- [Ta.M] < pressed for 1 sec in function mode = switch between display
gate status (horizontal bar)
and / input status (vertical bar).
- [Ta.M] < pressed for 1 sec in setting mode = switch between displays
Menu item (left display letter A, b, C, d)
and menu value (both displays with digits, 00-99)

- Use [Ta.+] and [Ta.-] to select the menu item to be changed [A0..d9].
- Use [Ta.M] < 1 s to select "Menu value" mode (display 00...99, digits only).
- Use [Ta.+] and [Ta.-] to set the required value.
- Press button < 1 s to reselect "Menu item" mode
- Adjust all settings using this schema.
- If the menu value is changed, this value is automatically adopted and saved.
- If none of the buttons are pressed for longer than 15 sec, the display switches back to gate status.
- During the setting mode it is not possible for the motor to run.

b) Gate type default setting

After all the additional equipment (SE, LS, ES...) and loads (motor, warning light, ...) have been connected, the gate type must be set first!

- The gate type can be preset using [M.A0].
- By changing [M.A0], all menu items are preset to the typical values for this type of gate (factory setting) and the force values and running times are deleted, so that new teaching runs must be carried out!
- Changing [M.A0] via [Ta.+] and [Ta.-] is only possible by simultaneously actuating [Ta.F], to prevent accidental adjustment!

c) Programming

Use the table from page 16 to set the required parameters for the individual menu items, and enter the selected values in the "Setting" column.

d) Deleting the force values and travel paths

- Press [Ta.-] and [Ta.+] simultaneously until "44" flashes in the display. During the deletion the two points in the display flash rapidly.
- Important: New teaching runs must be completed (see below).

e) Teaching runs / learn force values

- If all menu items have been set, 4 complete teaching runs from limit switch to limit switch must be completed to learn the force values and travel paths (for operation without limit switch [M.C6] = 02 only 2 teaching runs).

- During the teaching runs no STOP along the path is allowed! The gate must be able to travel unobstructed from limit switch to limit switch.
- The flashing digits in the display indicate how many teaching runs still have to be completed for which motor.

Command	Status/function
	Gate is closed:
1 x pulse or "OPEN"	Both leafs are moving "OPEN"
1 x pulse or "CLOSE"	Motor 2 moving "CLOSE", then motor 1 moves "CLOSE"
1 x pulse or "OPEN"	Both gate leafs are moving "OPEN"
1 x pulse or "CLOSE"	Motor-2 moves "CLOSE", motor 1 moves with delayed "CLOSE"

- The teaching runs are completed when the digits no longer flash.
- Check the forced stopping / obstruction detection and all connected safety devices for compliance with EN12445 and EN12453!

f) Reset the control unit (factory setting)

- The control unit can be reset by adjusting [M.A0] and then resetting to the "Original value".
- Procedure:
 - [Ta.M] pressed until [M.A0]..[M.d9] appears.
 - Use [Ta.-] to select menu item [M.A0].
 - Briefly press [Ta.M], menu value (00...07) is displayed.
 - Press [Ta.F] and simultaneously use [Ta.+] and [Ta.-] to adjust the menu value and then reset again.
 - Release [Ta.F].
 - All menu settings are reset to their basic values (factory setting) for the relevant gate type of [M.A0].
- **Important:** When the control unit is reset, the functions of the safety equipment are changes. It is necessary to reset the whole control unit and to complete new teaching runs.

7) Menu Table

Grey background: basic values (factory setting)

Menu	Value range	Function / values	Basic values								Setting
			[M.A0] = 00 2-leaf-Hinged gate	[M.A0] = 01 1-leaf-Hinged	[M.A0] = 02 Sliding gate	[M.A0] = 03 Folding gate	[M.A0] = 04 Roller shutter gate	[M.A0] = 05 Type 5	[M.A0] = 06 Type 6	[M.A0] = 07 Type 7	
A0		DEFAULT SETTING for gate type									
	00	2-leaf hinged gate	00	00	00	00	00	00	00	00	
	01	1-leaf hinged gate									
	02	Sliding gate									
	03	Folding gate									
	04	Roller shutter gate									
	05	Type 5									
	06	Type 6									
	07	Type 7									
		(Important: Changing effects all other menu items) Switch over only possible by simultaneously pressing the radio key									
A1	00..20	Motor voltage Smooth travel-out M1	10	10	10	5	10	10	10	10	
A2	00..20	Motor voltage Smooth travel-out M2	10	10	10	5	10	10	10	10	
A3	00..20	Motor voltage along path M1	20	20	20	20	20	20	20	20	
A4	00..20	Motor voltage along path M2	20	20	20	20	20	20	20	20	
A5		Length smooth travel motor1 and motor2									
	00	No smooth travel-out									
	01..20	Travel time in 0.5 sec steps before end position, start point self-teaching	05	05	05	05	05	05	05	05	
A6		START-UP TIME after motor start (start time, electric lock, electricity fade-out)									
	00..05	Start up time in 0.5 sec steps, 0.5..3.0 sec	02	02	02	02	02	02	02	02	
A7	00..30	Force in open M1 (electricity stop)	15	15	15	15	15	15	15	15	
A8	00..30	Force in close M1 (electricity stop)	15	15	15	15	15	15	15	15	
A9	00..30	Force in Open M2 (electricity stop)	15	15	15	15	15	15	15	15	
b0	00..30	Force in close M2 (electricity stop)	15	15	15	15	15	15	15	15	
b1		AUTOMATIC CLOSING									
	00	switched off	00	00	00	00	00	00	00	00	
	01..62	keep open time in 2sec steps, plus 5sec early warning									
	63..90	keep open time 63=3min, 64=4min, ... , 90=30min plus 5 sec early warning (Number – 60 = time in minutes)									
b2		LIGHT / WARNING LIGHT function									
	00	Only while motor running				00					
	01	1min overrun travel after motor operation									
	02	2min overrun travel after motor operation	02	02	02		02	02	02	02	
	03	3min overrun travel after motor operation									
	04	4sec before motor start open and close and while motor running									
	05	4sec before motor start open and close and while motor running - flashing (1Hz)									
	06										
	07	4sec before motor start close and while motor running									
	08	4sec before motor start close and while motor running - flashing (1Hz)									
	09	Status display: gate in OPEN end position Status display: gate in CLOSE end position									

Menu	Value range	Function / values	Basic values								Setting
			[M.A0] = 00 2-leaf - Hinged gate	[M.A0] = 01 1-leaf - Hinged	[M.A0] = 02 Sliding gate	[M.A0] = 03 Folding gate	[M.A0] = 04 Roller	[M.A0] = 05 Type 5	[M.A0] = 06 Type 6	[M.A0] = 07 Type 7	
b3		ELECTRICITY STOP / obstruction detection									
	00	opening: no effect closing: no effect									
	01	opening: no effect closing: stop									
	02	opening: no effect closing: release									
	03	opening: no effect closing: reversing									
	04	opening: stop closing: no effect									
	05	opening: stop closing: stop				05					
	06	opening: stop closing: release									
	07	opening: stop closing: reversing					07				
	08	opening: release closing: no effect									
	09	opening: release closing: stop									
	10	opening: release closing: release	10	10				10	10	10	
	11	opening: release closing: reversing			11						
	12	opening: reversing closing: no effect									
	13	opening: reversing closing: stop									
	14	opening: reversing closing: release									
	15	opening: reversing closing: reversing									
		Important: If electricity stop "no effect" the control unit can be damaged or destroyed in the event of overload!									
b4		PHOTOELECTRIC BARRIER function									
	00	opening: no effect closing: no effect									
	01	opening: no effect closing: stop									
	02	opening: no effect closing: release									
	03	opening: no effect closing: reversing			03	03					
	04	opening: stop closing: no effect									
	05	opening: stop closing: stop									
	06	opening: stop closing: release									
	07	opening: stop closing: reversing									
	08	opening: release closing: no effect									
	09	opening: release closing: stop									
	10	opening: release closing: release	10	10			10	10	10	10	
	11	opening: release closing: reversing									
	12	opening: reversing closing: no effect									
	13	opening: reversing closing: stop									
	14	opening: reversing closing: release									
	15	opening: reversing closing: reversing									
b5		Close after leaving the photoelectric barrier									
	00	Function switched off	00	00	00	00	00	00	00	00	
	01..20	Delay time in 0.5sec steps									

Menu	Value range	Function / values	Basic values								Setting
			[M.A0] = 00 2-leaf - Hinged gate	[M.A0] = 01 1-leaf - Hinged gate	[M.A0] = 02 Sliding gate	[M.A0] = 03 Folding gate	Roller chute gate	[M.A0] = 04 Type 5	[M.A0] = 05 Type 6	[M.A0] = 06 Type 7	[M.A0] = 07 Type 7
b6		CLOSING EDGE SAFETY DEVICE function									
	00	8k2	opening: no effect	closing: no effect							
	01	8k2	opening: no effect	closing: stop							
	02	8k2	opening: no effect	closing: release			02	02	02	02	02
	03	8k2	opening: no effect	closing: reversing							
	04	8k2	opening: stop	closing: no effect							
	05	8k2	opening: stop	closing: stop							
	06	8k2	opening: stop	closing: release							
	07	8k2	opening: stop	closing: reversing							
	08	8k2	opening: release	closing: no effect							
	09	8k2	opening: release	closing: stop							
	10	8k2	opening: release	closing: release	10	10	10				
	11	8k2	opening: release	closing: reversing							
	12	8k2	opening: reversing	closing: no effect							
	13	8k2	opening: reversing	closing: stop							
	14	8k2	opening: reversing	closing: release							
	15	8k2	opening: reversing	closing: reversing							
	16	OSE	opening: no effect	closing: no effect							
	17	OSE	opening: no effect	closing: stop							
	18	OSE	opening: no effect	closing: release							
	19	OSE	opening: no effect	closing: reversing							
	20	OSE	opening: stop	closing: no effect							
	21	OSE	opening: stop	closing: stop							
	22	OSE	opening: stop	closing: release							
	23	OSE	opening: stop	closing: reversing							
	24	OSE	opening: release	closing: no effect							
	25	OSE	opening: release	closing: stop							
	26	OSE	opening: release	closing: release							
	27	OSE	opening: release	closing: reversing							
	28	OSE	opening: reversing	closing: no effect							
	29	OSE	opening: reversing	closing: stop							
	30	OSE	opening: reversing	closing: release							
	31	OSE	opening: reversing	closing: reversing							
b7		Release time									
	00..15	Release time in 0.25 sec steps, 0.25..4.00 sec									
b8		EMERGENCY STOP input function									
	00	Automatic closing blocked after emergency stop									
	01	Closing time runs again after emergency stop release									
b9	02	After emergency stop next run in start travel, automatic closing blocked									
		Function of inputs A/B and radio receiver									
	00	A: Open pulse + panic	B: Close pulse + panic	00	00	00	00	00	00	00	00
	01	A: Open pulse + panic	B: Close pulse								
	02	A: Open pulse + panic	B: Close dead man								
	03	A: Open pulse	B: Close pulse + panic								
	04	A: Open pulse	B: Close pulse								
	05	A: Open pulse	B: Close dead man								
	06	A: Open dead man	B: Close pulse + panic								
	07	A: Open dead man	B: Close pulse								
C0	08	A: Open dead man	B: Close dead man								
	09	A: Pulse (open-stop-close-...)	B: Active leaf / partial opening								
		Duration of the PARTIAL OPENING									
	00	Active leaf mode (only in 2-leaf mode)									
	01..99	Running time until partial opening/ventilation position in 0.5 sec steps									

Menu	Value range	Function / values	Basic values								Setting
			[M.A0] = 00 2-leaf - Hinged gate	[M.A0] = 01 1-leaf - Hinged gate	[M.A0] = 02 Sliding gate	[M.A0] = 03 Folding gate	[M.A0] = 04 Roller clutter gate	[M.A0] = 05 Type 5	[M.A0] = 06 Type 6	[M.A0] = 07 Type 7	
C1		1- / 2- LEAF MODE									
	00	2- leaf mode	00			00		00	00	00	
	01	1- leaf mode		01	01		01				
C2		Closing delay in 2-leaf mode									
	00	No closing delay		00	00	03	00				
	01..19	Closing delay in 0.5sec steps									
	20	Closing delay is automatically learnt	20					20	20	20	
C3		Open delay in 2-leaf mode									
	00	No opening delay		00	00	03	00				
	01..19	Opening delay in 0.5sec steps	04					04	04	04	
C4		Relay output OUT function									
	00	Electric lock (during startup time, see menu A6)	00	00			00	00	00	00	
	01	Photoelectric barrier test									
	02	Status display: gate in OPEN end position			02						
	03	Status display: gate in CLOSE end position				03					
	04	Radio module function 8 and 9 (if current surge drop after 10min)									
C5		Running time limit									
	00..99	in 1 sec steps, 1 sec..100sec	99	99	99	15	99	99	99	99	
C6		Type of LIMIT SWITCH									
	00	Internal limit switch (in the motor cable)									
	01	External limit switch (connected to terminals 16-21)	01	01	01		01	01	01	01	
	02	No limit switch (electricity stop only) only permissible with safety strips!				02					
C7	00	-									
C8	00	-									
C9	00	-									
d0	00	-									
d1	00	-									
d2	00	-									
d3	00	-									
d4	00	-									
d5	00	-									
d6	00	-									
d7	00	-									
d8		Service mode									
	00	control panel free, menu items adjustable	00	00	00	00	00	00	00	00	
	01	control panel blocked, menu items not adjustable Switchover: emergency stop, Simultaneously press + key and – key , Switchover with menu key									
d9		Trip counter (read only, cannot be changed)									
	00	100,000 digit									
	01	10,000 digit									
	02	1,000 digit									
	03	100 digit									
	04	10 digit									
	05	1 digit									

8) Functional Description

a) Radio module

- The radio frequency and modulation type is determined by the plug-in radio module in [Bl.1].
- The transmitter coding is teaching. Up to 40 codes (transmit keys) can be teaching with different functions.
- The motor control unit can either learn the 12 bit dual coding schema, the 18 bit tristate coding schema or Keeloq coding. Further coding types by arrangement.
- The type of coding schema is specified during teaching of the first transmitter – after deleting all codes. The first learning process can take up to 10s!
- If an already teaching transmitter is re-teaching, the control unit recognises this and does not allocate any more of the 40 memory locations.

Teaching a transmitter:

- Briefly press [Ta.F] once. Radio LED flashes.
- The 7 segment display shows which function is being learnt.
- Press [Ta.F] until the required function is displayed (F0..F9).
- Press the transmit key to be teaching until the “Radio” LED is permanently lit. The transmitter has now been teaching.
- If a transmitter is not teaching, learn mode is automatically quit after 15 s.

Functions for operation with radio module

- {F0} Pulse (open-stop-close-..) (not for dead man)
- {F1} Open pulse with panic function, i.e. stop while motor running
- {F2} Close pulse with panic function, i.e. stop while motor running
- {F3} Stop
- {F4} Partial opening / active leaf *
- {F5} Light
- {F6} Open pulse (without panic function)
- {F7} Close pulse (without panic function)
- {F8} OUT relay (active if [M.C4] = 04) pulse function
- {F9} OUT relay (active if [M.C4] = 04) current surge function

* Note: If dead man function is set via [M.b9], the relevant direction of travel cannot be controlled by radio!

Delete all transmitters:

- Keep [Ta.F] pressed for approx 6 s.
- Radio LED flashes fast and in {FL} flashes in the display.
- If the flashing stops, all coding is deleted.

b) Input A and B and radio receiver

- The inputs A and B and channels 1 and 2 of the radio receiver slot are connected in parallel.
- The function of the inputs A, B [Kl.25]+[Kl.26]+[Kl.27] and the radio receiver in [Bl.2] can be selected via [M.b9] between open, close, pulse and partial opening.
- If dead man's mode is set, radio mode via the radio module is blocked for the relevant direction of travel. Operation with radio receiver in [Bl.2] is not permitted in this direction of travel.

- If the panic function is set in [M.b9] for input A or B, actuating the corresponding input during gate travel always causes the gate travel to stop. Only a further actuation restarts the gate in the required direction of travel.
- If no panic function is set, actuation during gate travel causes stop in opposite direction and immediate start in opposite direction, the actuation has no effect in the same direction.
- Simultaneous actuation of input A and input B effects the emergency stop function.

c) Automatic closing

- Automatic closing is activated or adjusted via [M.b1].
- If [M.b1] = 00, automatic closing is inactive
- The values 01..62 correspond to a keep open time in 2sec steps.
- From the value 63..90 the keep open time is counted in minute steps (i.e. value – 60 = time in minutes)
- If the gate is not in the CLOSE end position, after the keep open time [M.b1] has expired an early warning is issued for 5 s via the light output, before the gate moves into CLOSE end position.
- While the keep open time is running, the point in the right display is lit. During the early warning the point in the right display flashes.
- If automatic closing is activated a pulse command always causes travel to OPEN end position.
- If the gate is in OPEN end position, a pulse command only resets the keep open time.
- As long as a pulse or open command is applied, the keep open time remains reset. Only after there is no open/pulse command applied or queued does the keep open time begin to count (suitable for time switch control unit).
- Commands for specific open/close are active even if automatic closing is active.
- Closing is stopped and the keep open time is reset via the LS input.
- If, during closing, the gate is stopped by forced stopping, the automatic closing is blocked until the next pulse, open, close, TÖ or radio command.
- If the unit is switched off twice consecutively via SE while closing, automatic closing is blocked after the second unsuccessful closing until the next pulse, open, closed, TÖ or radio command.
- If [M.b8] = 00, after actuating the emergency stop, automatic closing is blocked until the next pulse, open, close, TÖ or radio command.
- If the motor is at a standstill only resetting of the keep open time (no switching off) occurs in SE. Only after the input is no longer actuated does the keep open time begin to count.
- If automatic closing is activated it is always active one of the gate leafs is not in the CLOSE limit switch. I.e. automatic closing takes place even in partial opening and active leaf mode.

d) Partial opening (TÖ)

- Partial opening can be controlled via input B, the second channel of a radio receiver in [Bl.2] or via function (F4) in radio module mode.
- The partial opening time is set via [M.C0].
- The running time is a reference for the part open position. Therefore, slight deviations in the opening position can occur.
- A partial opening command when the gate is in CLOSE end position always causes travel to the part open position.

- If the gate is outside the CLOSE end position, if a partial opening command is issued the gate moves to the CLOSE end position.
- Even if automatic closing is activated, the gate can be moved by a partial opening command in the part open position. After the closing time has expired the gates automatically close.
- A pulse command while the gate is in the part open position causes it to travel to the OPEN end position.
- If a part open position is set via [M.C0], active leaf mode is not possible.

e) Active leaf (GF)

- Active leaf mode (only in 2-leaf mode) can be controlled using the open-stop-close-stop function, for motor 1 only, via input B, the second channel of a radio receiver in [Bl.2] or via function (F4) in radio module mode.
- Active leaf mode is only possible if the partial opening time is set in [M.C0] = 00.
- An active leaf command is only active if motor 2 is in CLOSE end position.
- Even if automatic closing is active, the gate can still be controlled via an active leaf command. After the closing time has expired the gate automatically closes.
- A pulse command after an (effective) active leaf command always causes travel to open.

f) Closing delay: (in 2-motor mode)

- The closing delay between motor 1 and motor 2 can be set via [M.C2].
- If [M.C2] = 00 (no closing delay), both motors always simultaneously start in the CLOSE direction.
- If [M.C2] = 20 (closing delay automatically learnt) the runtimes of both motors are determined during the teaching runs and the closing delay is determined so that motor 1 reaches the CLOSE end position approx 3-4 sec after motor 2.
- The closing delay [M.C2] must be set so that so the closing edge never moves at a flat horizontal angle toward the opposite leaf, which could cause damage to the gate system and hazards for objects and people!

g) Opening delay: (in 2 motor mode)

- The opening delay between motor 1 and motor 2 can be set via [M.C3].
- If [M.C3] = 00 (no opening delay), both motors always start simultaneously in the OPEN direction.
- The opening delay [M.C3] must be set so motor 2 is not obstructed by motor 1 during opening (contact by closing edge).

h) Smooth start

- When the motor starts the gate is slowly accelerated to the final speed.
- The duration of this start time, during which the gate leafs are accelerated, depends on the startup time after motor start [M.A6]. The larger the value, the slower the gate is accelerated.

i) Smooth travel-out length and motor voltage

- Before the gate has reached the end position, the voltage is reduced causing the gate to slowly move into the end position.
- The travel-out voltage can be separately set for motor 1 and motor 2 via [M.A1] and [M.A2]. The smaller the value, the slower the gate moves (minimum speed = 00, maximum speed = 20).

- The settings for the length of the travel-out are entered via [M.A5]. The larger the value the longer the smooth travel before the end position. During the teaching runs the starting point of smooth travel is determined separately for each direction of travel and motor.
- Each time changes are made to [M.A1], [M.A2] and [M.A5], the force values and travel paths are deleted and new teaching runs must be completed.
- The motor voltage affects the force values for forced stopping. After the motor voltage has been changed the closing forces must be checked and if necessary corrected via [M.A7]..[M.b0].

j) Motor voltage over travel path

- [M.A3] and [M.A4] can be used to separately set the voltage over the travel path for motor 1 and motor 2. The smaller the value, the slower the gate moves (minimum speed = 00, maximum speed = 20).
- The motor voltage influences the force values for forced stopping. If the motor voltage is changed the closing forces must be checked and if necessary corrected via [M.A7]..[M.b0].
- Each time a change is made to [M.A3] and [M.A4], the force values and travel paths are automatically deleted and new teaching runs must be completed.

k) Smooth stop

- A stop command along the travel path causes slow coasting of the motor. It is not stopped abruptly. (exception: forced stopping, SE, LS, emergency stop).
- There is no smooth stop in dead man's mode.

l) Light / warning light

- [M.b2] is used to set the function of the light/ warning light output.
- If a warning light is connected to the light output, the menu values 00 (for motor running) and 04-07 (engine running+early warning) are provided. If 04 and 05 an early warning of 4sec is given before engine running in OPEN and CLOSE-direction and if 06 and 07 only before engine running in CLOSE direction.
- Menu values 04 and 06 are intended for a self-flashing warning light, in 05 and 07 the flashing is generated by the light relay.
- If [M.b2] = 08 or 09 the light relay switches if the gate is in OPEN or CLOSE end position (M1+M2, in 1-leaf gate M1 only).

m)Emergency stop

- The emergency stop input directly switches off the motor relay for safety reasons and is therefore still active even if the electronics fail!
- If the emergency stop input is actuated the motor stops immediately.
- The switched status of the emergency stop input is displayed by the red LED behind the terminals [KI.14]+[KI.15].
- If the emergency stop command is given while the motor is running, the next time the pulse command is given, the gate travels in the "opposite direction" (away from the danger spot).
- If an emergency stop command is given while the gate is at a standstill, in general the gate opens the next time a pulse command is given.
- If [M.b8] = 00, after the emergency stop is actuated the automatic closing is blocked until the next pulse/open/close/TÖ/radio command.
- If [M.b8] = 02 is set, the next gate travel after an emergency stop is with half speed only.

n) Electricity stop / obstruction detection

- The control unit learns the maximum motor current for each direction of travel and each motor.
- If this value plus the adjustable allowance value [M.A7]..[M.b0] is exceeded after the teaching run, a stop, release or reversing is executed depending on the [M.b3] setting and the direction of travel.
- Higher force values [M.A7]..[M.b0] result in the switching off reacting with less sensitivity (more force).
- **Important:** If the setting is too insensitive there is a risk of injuries due to late or lack of switching off!
- An electricity stop is displayed by the error code {Er.27} or {Er.28}.
- During the motor startup the electricity stop is inactive for the adjustable time set via [M.A6] (startup current faded out).
- It is only necessary to change the allowance value if the gate stops via electricity stop, although the travel was not disrupted by an obstruction, or does not stop despite an obstruction.
- The force values are corrected slightly with each uninterrupted travel from limit switch to limit switch. This achieves adaptation to aging of the system, and summer / winter use.
- During the teaching runs the electricity stop is inactive.
- The motor voltage in smooth travel and along the travel path [M.A1]..[M.A4] affects the force values for the electricity stop. If the motor voltage is changed the closing forces must be checked and if necessary corrected.
- [M.b3] may only be set to 00, if safety and compliance with the closing forces is ensured by external equipment!
- The function of the electricity stop [M.b3] can be adjusted to "without limit switch" [M.C6] = 02 for the type of limit switch, but always has the function stop in open and close (as end position detection).

o) Force values

- [M.A7]..[M.b0] can be used to change the control unit's force values, separately for each motor, in the open and close direction.
- During operation without limit switch [M.C6] = 02, the force values equal the current values at which the control unit switches off and are interpreted as the end position.
- During operation with limit switches the typical motor currents are teaching during the teaching runs. The force values that can be set in [M.A7]..[M.b0] are allowance values. If the teaching current is exceeded by more than the allowance value, the control unit interprets it as an obstruction.

p) Closing edge safety device (SE)

- An 8K2 safety strip or an opto-electronic terminal strip (OSE) can be connected to the SE input. [M.b6] must be set accordingly.
- The status of the SE input is represented by the LED behind the terminals [Kl.23]+[Kl.24].
- In the event of a short circuit or interruption the SE input is actuated.
- A motor start while SE input is actuated is only possible if the closing edge safety device does not have any effect in the relevant direction of travel [M.b6].
- While a motor is running a command at the SE input causes a stop, release or reversing, depending on the direction of travel and setting [M.b6].

- If automatic closing is active, actuating the SE input causes the closing time to be reset until the input is re-released.
- The SE input is self-monitoring. The input is tested during each self-test. If an error is detected, it is not possible to start {Er.12}.
- As the OSE self-test lasts approx 2 s, the control unit is blocked for this time after each motor run for the direction of travel selected in [M.b6].
- If the SE input is not used the [J1] must be connected to NC (8k2 resistor is switched on internally) and [M.B6] set to 8k2 (= 10)[X4].
- External safety devices must be approved for protection of people and are not tested by the control unit!

q) Photoelectric barrier input (LS)

- A photoelectric barrier or an electrical safety contact strip with a floating break-contact element can be connected to the LS input.
- If the input is not used, it must be jumpered with a wire jumper (delivered condition).
- The switched status is displayed via the yellow LED behind the terminal [Kl.22]+[Kl.23].
- A motor start while LS input is activated is only possible if the input has no effect in the relevant direction of travel [M.b4].
- While a motor is running a command at the LS input causes stop, release or reversing, depending on the direction of travel and setting [M.b4].
- If automatic closing is active, actuation of LS input resets the closing time until the input is re-released.
- The LS input is self-monitoring and is tested during each self-test. At the same time the LED behind terminal [Kl.22]+[Kl.23] briefly flashes.
- If an error is detected in LS input {Er.13}, it is not possible to start.
- External safety equipment must be approved for the protection of people and is not tested by the control unit!
- External testing of photoelectric barrier: see relay output OUT

r) Release

- After LS or SE input is actuated or via electricity stop, depending on the set function, the obstruction can be released (short travel away from the obstruction).
- During this, the gate is moved for the time set via [M.b7] in the opposite direction.

s) Close after leaving the photoelectric barrier

- The "close after leaving the photoelectric barrier" function can be activated via [M.b5].
- If [M.b5] = 00, the function is inactive.
- If the photoelectric barrier is left while the gate is open, closing is started after the time set via [M.b5] has expired.
- Actuation of photoelectric barriers while the gate is moving is temporarily saved. As soon as the gate has stopped, it starts to close after the time set via [M.b5] has expired.

t) 1 /2 leaf mode

- [M.C1] can be used to set the control unit for 1 and 2-leaf mode.
- Particularities of 1-leaf mode:
 - Motor 2 is inactive. The limit switch ES2 open and close does not have any function and the corresponding LEDs are always off.

- The right display in the gate status display (horizontal bar) remains empty.
- Opening [M.C3] and closing delay [M.C2] do not have any function.
- Active leaf mode is not possible.

u) Relay output OUT

- The relay output OUT is a floating relay output for max. 24V and max. 4A.
- The following functions can be selected via [M.C4]:
 - E-lock: The relay is closed during the motor start-ups (M1 and M2) in open and close mode for the duration of the startup time [M.A6].
 - Photoelectric barriers test: The relay is permanently picked up and briefly released during a self-test. The power supply to the photoelectric barrier transmitter is connected via the OUT relay. By switching off the transmitter during the self-test, the receiver must signal actuation of the photoelectric barrier. This is analysed in the software. The reaction of the LS receiver must be follow within 2.5sec after the OUT relay is switched off.
 - Status display: If the gate is in the OPEN or CLOSE end position (M1+M2, for 1-leaf M1 only) the relay closes.
 - Radio function: The OUT relay can be directly controlled in radio module mode using the function {F8} and {F9}, in order to switch further functions outside the control unit. In current surge mode the OUT relay switches off again 10min after motor operation during self-test.
 - Forwarding open command: If the control unit starts in open, the OUT relay is closed for 0.5sec. Therefore, several controls can be controlled synchronously in connection with automatic closing.

v) Running time limit

- The maximum running time of the motors can be set in seconds via [M.C5].
- If the maximum running time of a motor set using [M.C5] is exceeded while a motor is running (e.g. in the event of a transmission failure or travelling over the limit switch), the control unit stops both motors with the fault message {Er.24}.

w) Type of limit switch

- [M.C6] must be used to set the type of limit switch during the putting into service.
- For internal limit switches [X3], the break contact elements are connected in the motor cable and therefore directly switch off the motor current. The control unit detects that the motor current is no longer flowing and interprets this as the end position. In order to start the motor again from the end position, rectifier diodes must be connected parallel to the limit switches. (Advantage: only two cables to the motor. Disadvantage: limit switch and diodes must be able to switch the motor current.)
- External limit switches are connected to the terminals [Kl.16]..[Kl.21].
- During operation without limit switch the end position is detected by the electricity stop. To this end the turn off current must be set for detection of the end position via [M.A7]..[M.b0]. The electricity stop function cannot be used for obstruction detection, as only one stop ever occurs (no release, no reversing). Settings in [M.b3] have no effect.
- Operation without limit switch is only possible if the gate hits a limit stop in the end positions.

- For operation without limit switch, obstruction detection and compliance of the closing forces must be secured via external safety equipment (photoelectric barrier, contact strip).
- For operation without limit switch, instead of the usual 4 teaching runs, there are only 2 teaching runs, as only the running times (for closing delay and onset point for smooth travel have to be learnt) and the forces do not have to be learnt.
- The limit switch LEDs behind the terminals are only active for operation with external limit switches. In the other operating modes the LEDs are always off.

x) Service mode

- The menu [M.d8] can be used to secure all menu items against adjustment. In the delivered condition the menu items can be adjusted.
- [M.d8] can only be adjusted from 0 to 1 and vice versa, in that the emergency stop is actuated and [Ta.+] and [Ta.-] are simultaneously actuated.
- If the menu items are secured against adjustment, the values of the individual menu items can be read, however they can no longer be adjusted.
- After installation of the control unit and gate system has been completed, the menu items should always be secured against adjustment.

y) Trip counter

- [M.d9] can be used to read the number of gate movements (trips in open direction).
- Each start in the open direction is counted.
- Instead of the menu value, the display for menu item [M.d9] shows in the left display which digit is currently shown in the right (1s, 10s, ..., 100,000s digit). [Ta.+] and [Ta.-] are used to switch between the individual 10s digits.
- If the display shows e.g. 00, 10, 21, 34, 47, 59, this means the controls have already carried out $(0 \cdot 100,000 + 0 \cdot 10,000 + 1 \cdot 1,000 + 4 \cdot 100 + 7 \cdot 10 + 9 \cdot 1) = 1479$ trips in the open direction.
- The trip counter cannot be reset or changed.

9) Error Messages

Errors are indicated by alternating flashing of "Er" (error) and the error number. {Er.00} to {Er.13} are self-test error measures.

Error No.	Error description	Action
00	ROM test	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a hardware error in the controller. The control unit must be replaced.
01	RAM test	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a hardware error in the controller. The control unit must be replaced.
02	Watchdog test	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a hardware error in the control unit. The control unit must be replaced.
03	EEprom access	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a hardware error in the control unit. The control unit must be replaced.
04	EEprom data	Switch off power, wait 10 sec, switch power back on. If the error message is still active, the saved menu parameters, the force values or the travel paths are no longer correct. Only [M.A0] can be accessed. Adjustment to another menu item is not possible. The control unit must be reset and re-adjusted. New teaching runs must then be completed.
05	M1 current measurement	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a hardware error in the control unit. The control unit must be replaced.
06	M2 measurement	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a hardware error in the control unit. The control unit must be replaced.
07	Switch off relay M1	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a short-circuit in the relay for M1. The control unit must be replaced.
08	Switch off relay M2	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a short-circuit in the relay for M2. The control unit must be replaced.
09	Switch off relay M1+M2	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a short-circuit in the relay control for M1 and M2. The control unit must be replaced.
10	Transistor switch off M1	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a short-circuit in the transistor for M1. The control unit must be replaced.
11	Transistor switch off M2	Switch off power, wait 10 sec, switch power back on. If the error message is still active, there is a short-circuit in the transistor for M2. The control unit must be replaced.
12	Hardware SE	Switch off power, wait 10 sec, switch power back on. If the error message is still active: a) Check setting [M.b6] and [J.1] with respect to connected closing edge safety device.

		b) Check connection of the closing edge safety device, especially the earth connection at terminal [KI.23]. c) If a) and b) correct, there is possibly a hardware error in the control unit. The control unit must be replaced.
13	Hardware LS	Switch off power, wait 10 sec, switch power back on. If the error message is still active: a) check setting [M.b4] and [M.C4] (external LS test) with respect to connected photoelectric barrier. b) Check connection of the photoelectric barrier, especially earth connection at terminal [KI.23]. c) if a) and b) correct, there is possibly a hardware error in the control unit. The control unit must be replaced.

{Er.20} to {Er.29} are fault messages and show the cause of the last motor stop.

Fault No.	Fault message	Action
20	No current in the startup motor 1	Give renewed start command. If gate travel interrupted again with error message this means that no motor current was measured. a) Current of motor 1 is too low (<1A) => Motor and control unit do not match b) no motor connected to [KI.5]+[KI.6]. c) Motor defective or cable break.
21	No current in startup motor 2	Give renewed start command. If gate travel interrupted again with error message this means that no motor current was measured. a) Current of motor 2 is too low (<1A) => Motor and control unit do not match b) no motor connected to [KI.5]+[KI.6]. c) Motor defective or cable break.
22	Motor stop by LS	Gate travel was stopped by actuation of the LS input. Check whether obstruction in the way. If no, check photoelectric barrier and setting of [M.b4]
23	Motor stop by SE	Gate travel was stopped by actuating the SE inputs. Check whether obstruction in the way. If no, check safety strip and setting of [M.b6]
24	Motor stop due to exceeding of running time	Motor operation was longer than set in [M.C5]. Check motor, transmission, emergency release. If necessary adjust [M.C5] to gate running time.
25	Emergency stop actuated	Gate travel was interrupted by actuation of the emergency stop input or simultaneous actuation of input A and input B (or radio receiver channel 1 + 2).
26	Electricity stop motor 1	The control unit stopped gate travel, as the forces at motor 1 exceeded the teaching and permitted values. a) Check whether obstruction in the way. b) Check gate leaf for smooth running and M1. c) Delete forces and travel path and carry out new teaching runs. d) Check force values in [M.A7] and [M.A8] and increase if necessary.
27	Electricity stop motor 2	The control unit has stopped gate travel, as the forces at motor 2 exceeded the teaching

		<p>and permitted values.</p> <p>a) Check whether obstruction in the way.</p> <p>b) Check gate leaf for smooth running and M2.</p> <p>c) Delete forces and travel path and carry out new teaching runs.</p> <p>d) Check force values in [M.A9] and [M.b0] and increase if necessary.</p>
28	Undervoltage	<p>The supply voltage to the control unit is temporarily or continuously too low.</p> <p>Check mains connection.</p>

10) Technical Specifications

The control unit may only be used if the technical specifications are observed!

Parameter	Symbol	Limit values			Units	Test condition
		Min.	Typical	Max.		
Power supply						
Mains voltage	U _{mains}	190	230	250	V _{AC}	At terminals 1 / 2
Mains frequency	F _{mains}	48	50	52	Hz	
Secondary voltage	U _{Sec}	18	24	29	V _{AC}	at terminals 32 / 33 at rest / at full load
Internal logic voltage	U _V	4.8	5.0	5.2	V	
Current input when idle	I _R		40		mA	terminals 32 / 33, no loads / cards
Power input	P _{Prim}		2.0	2.5	VA	terminals 32 / 33, no loads / cards
Start time voltage / 1 st start	t _{Start}		2.5	3.5	s	@ U _{Secondary} = 24V _{AC}
Inputs						
Emergency stop not actuated (closed)	U _{EMERclosed}	0.0		0.5	V	Via terminals 14 / 15
Emergency stop actuated (open)	U _{EMERopen}			1.0	V	Terminal 15 / 0V
Emergency stop current (closed)	I _{EMER}		170	200	mA	Via terminals 14 / 15
ES open / close not actuated (closed)	U _{ESclosed}			0.5	V	Terminal 16, 18, 19, 21 against 0V
ES open / close actuated (open)	U _{ESopen}	4.5			V	Terminal 16, 18, 19, 21 against 0V
ES open / close current (closed)	I _{ES}		0.5	1.0	mA	Via terminals 16/17, 18/17, 19/20, 21/20
Photoelectric barrier not actuated (close)	U _{Lsclosed}			0.5	V	Terminals 22 / 23
Photoelectric barrier actuated (open)	U _{Lsopen}	4.5			V	Terminal 22 against 0V
Photoelectric barrier short-circuit current	I _{LSin-0}		0.5	1.0	mA	Via terminals 22 / 23
Photoelectric barrier reaction time	t _{LS-1}		25	50	ms	Time LS-command until motor switched
Photoelectric barrier reset time	t _{LS-0}		250	350	ms	
SE (8K2) not actuated	R _{SE12-0}	6.0	8.2	13.0	KΩ	terminals 23 / 24
SE (8K2) actuated	R _{SE12-1}	17.0		5.5	KΩ	terminals 23 / 24
SE (OSE) level, release	U _{SE12OSE-0}	4.0		1.0	V	terminals 23 / 24
SE (OSE) frequency	f _{SE12OSE-0}	0.5	1.0	2.0	KHz	terminals 23 / 24
SE reaction time	t _{SE12-1}		25	50	ms	At 8K2 or OSE
SE reset time	t _{SE12-0}		250	350	ms	
A / B not actuated (open)	U _{O-AB}	4.5			V	At terminals 25 / 26, 27 / 26
A / B actuated (closed)	U _{CI-AB}			0.5	V	At terminals 25 / 26, 27 / 26
A / B pulse duration (debounce)	T _{AB}	30	35	50	ms	
NF Low level	V _{NFLow}			0.7	V	@ U _V = 5.0V, Pin14 of BL1
NF High level	V _{NFHigh}	3.5			V	@ U _V = 5.0V, Pin 14 of BL1
Outputs						
Voltage 12V output	U _{12V}	11.5	12.0	12.5	V _{DC}	Full load / idle mode
Current 12V output	I _{12V}			40	mA	
Voltage 24V output	U _{24V}	20	32	39	V _{AC}	Full load / idle mode
Current 24V output	I _{24V}			200	mA	
Motor current	I _{Motor}	1.0		11.0	A	
Current allowance value	I _{Zug}	0.4		5.0	A	Adjustable via menu
Motor running time	t _{Mot}	1		100	S	
Motor operating time	ED			25	%	At maximum motor current, max running time
OUT maximum voltage	U _{Out}			30	V	At terminals 12 / 13
OUT maximum current	I _{Out}			4	A	At terminals 12 / 13
Warning light output	P _{Warn}			500	W	At terminals 3 / 4
Radio (radio module mode)						
Receiver data						Depending on plug-in card radio module / receiver
Coding systems						12- / 18-Bit linear, Keeloq (others on request)
Teaching capable transmission buttons	N _{transmitter}			40	Each	Transmission buttons
Ambient conditions						
Operating temperature	T _{oper}	-20		+50	°C	In normal installed position
Storage temperature	T _{stor}	-25		+80	°C	
Relative air humidity	RH	20		90	%	No condensation permitted!
Printed circuit board						
Controller frequency	f _{Cont}		4.19		MHz	Internal PLL at 16.76MHz
Length	L _{LP}		110		mm	
Width	B _{LP}		166		mm	
Height	H _{LP}		45		mm	
Weight	m _{LP}		320		g	Without radio module, no other plug-in card
Housing						
Length	L _{Hous}		255		mm	Without cable entry
Width	B _{Hous}		176		mm	

Motor control unit DCM31

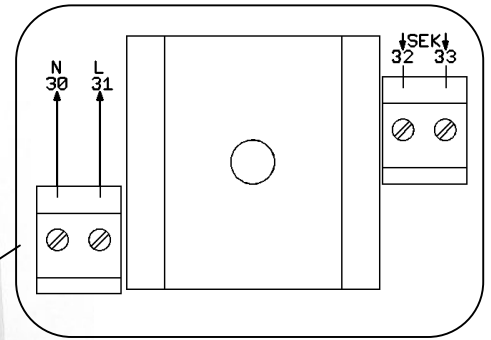
Height	H _{hous}		80		mm	
Weight	M _{hous}		980		g	incl. electronics, without toroidal transformer
Material						ABS, self-extinguishing
Degree of protection						IP54

11) Notes

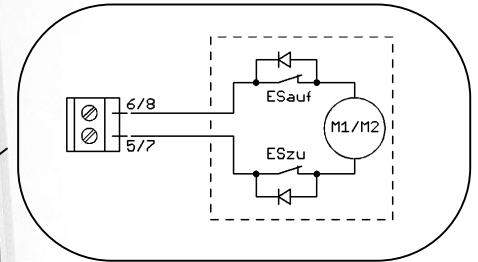
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12) Images/Diagrams

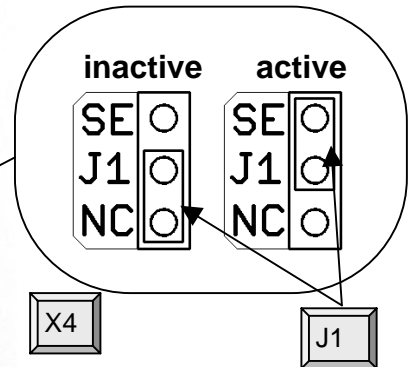
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X2

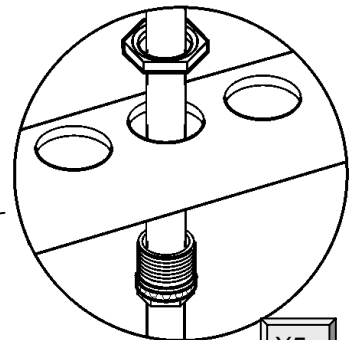


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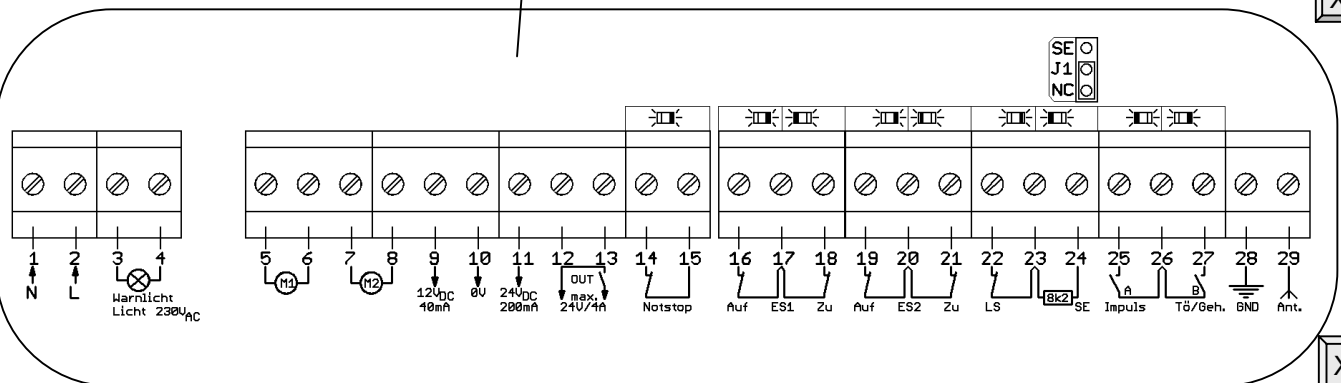


X4

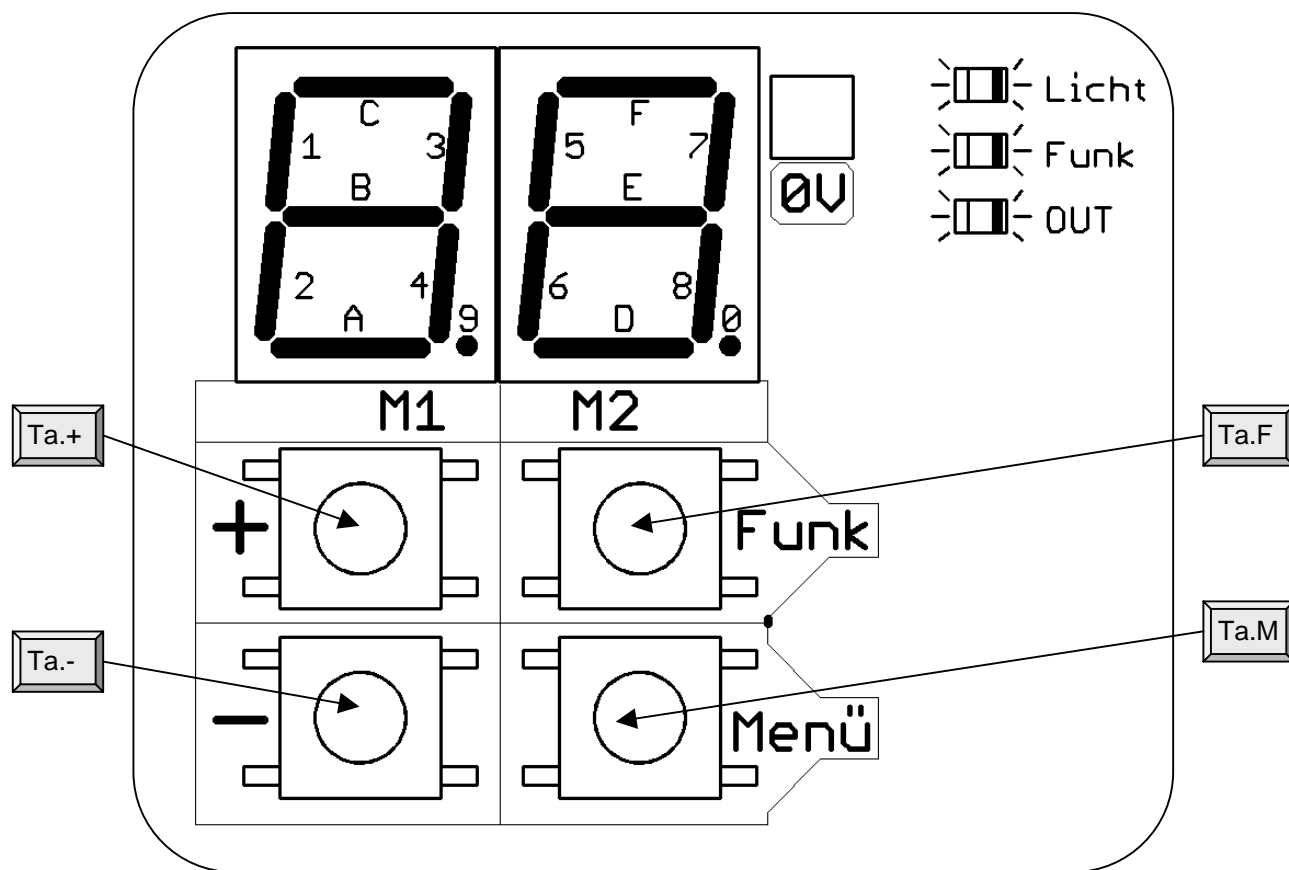
J1



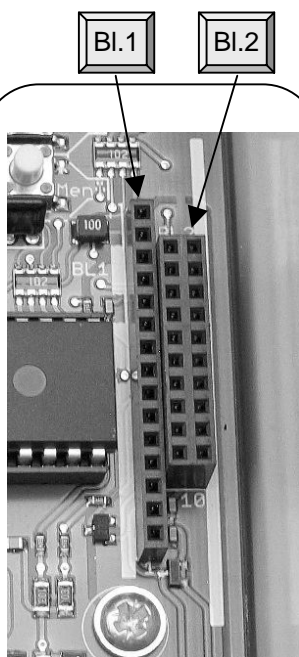
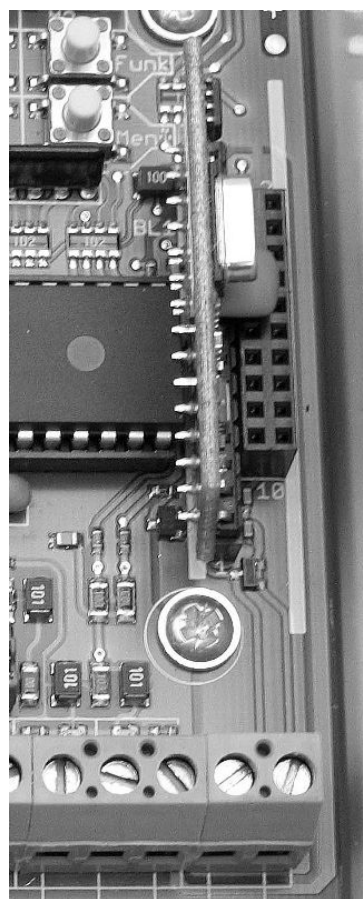
X5



X6



X7



X9

X8

X10

